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STATUS OF FARMING IN THE LOWER RIO GRANDE IRRIGATED DISTRICT OF TEXAS.

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DESCRIPTION OF AREA.

The present irrigable lands of the lower Rio Grande district are located in the southern portions of Cameron and Hidalgo Counties, in the extreme southern part of Texas. Brownsville, the largest city, is 372 miles southwest of Houston. (See fig. 1.)

FIG. 1.—Location of the lower Rio Grande irrigated district, Tex. (shaded area).

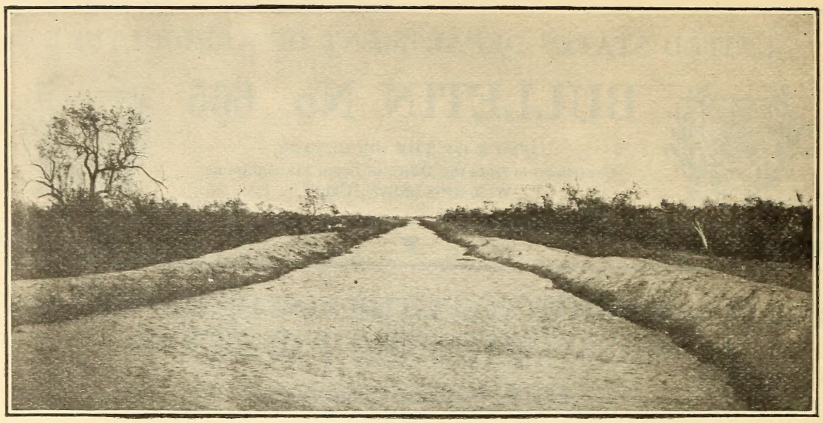

FIG. 2.—A main canal. This is the common type of ditch which conducts water from the river to the farms. Note the native vegetation and the wild state of the country before development.

The greater portion of the land in its natural state is covered with a considerable growth of mesquite, huisache, ebony, cactus, and other trees and shrubs (see fig. 2). The alluvial or lower-lying soils generally support a heavier growth than the lighter textured soils in the northern and western portions of the area.

The topography of the region (see fig. 3) is level to undulating. In general the land bordering the stream channels or "resacas" is slightly higher than that at a distance, due to overflows and the resulting deposit of sediment near the channels. The elevation varies from about 30 feet above sea level in the vicinity of Brownsville to about 250 feet north of Mission in the western part of the region.

The drainage of the region is not generally good. The lower lands in the eastern portions, many of which have heavy types of soil, are not so well drained as the lighter textured soils of Hidalgo County. On account of the fact that the banks of the Rio Grande and other channels are higher than the bordering land, the surface water has little opportunity to drain away, so that after heavy rains or excessive irrigation water stands in small lakes or ponds for considerable periods. However, the higher land outside of the delta formation has fairly good drainage owing to its comparatively steep slope.

Artificial drainage by means of surface ditches is being undertaken, particularly in Cameron County. Drainage districts have been formed, and bonds have been issued providing the funds for the ditch construction. The facilities now provided are improving the conditions, and it is only a question of time when artificial drainage will cover practically the whole region.

In many local areas where open-ditch drainage facilities have been provided but have not proved adequate, tile drainage has been substituted and is meeting the difficulties where satisfactory outlets may be had. It has been clearly demonstrated here, as elsewhere, that

where natural drainage is not exceptionally good artificial drainage must be provided where irrigation is practiced extensively.

The soils of the region are generally alluvial in origin and are exceedingly varied in character. There are low-lying areas that are poorly drained and are permeated with alkali, but the greater portion of the land is fertile and produces good crops when proper cultural methods are followed.

FARM FACTS.

During 1914–15 the writer visited several hundred farms in the lower Rio Grande district and secured information from the farmers themselves relating to the farm enterprises. The following pages give some data from the detailed study of these enterprises as well as of the entire business of 59 farms of the region, distributed from a point below Brownsville to a point north of Mission, a distance of about 70 miles. These farms are classified according to type as follows: Twenty-six truck farms, 16 stock farms, and 17 staple crop farms.

SIZE OF FARMS.

The farms studied vary in size from 10 acres of crop land to 200 acres, with an average of 59 acres, or 73 acres of total farm area. The area of crop land in this region does not always measure the size of the business on account of the difference in intensity of the various types of farms. When total expenses are used as a measure of size it is found that while staple crop farms average 87 acres as compared with 63 acres for truck farms, the expenses of operation of the truck farms are nearly $1,000 greater per year than those for staple crop farms.

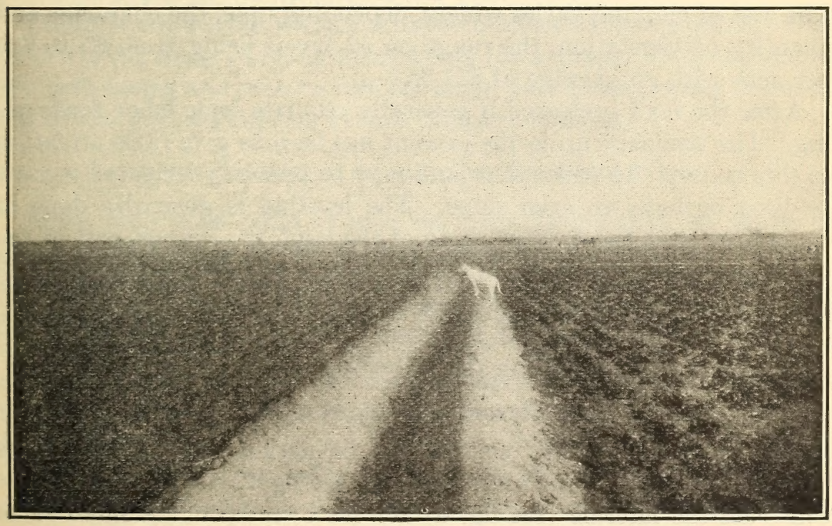

FIG. 3.—A lateral irrigation ditch on a farm. The ditches are sometimes plowed down and reconstructed annually in place of cleaning them. Lettuce borders this lateral.

It appears that farms of less than 40 acres are not large enough in general for any type of farm. In fact the larger the size of farm, the greater is the amount of profit under average conditions, at least, to the point where the operator can properly supervise the farm operations.

INVESTMENT PER FARM.

The average farm of 59 acres of crop land when developed represents a total investment of approximately $14,000. Land represents slightly more than $10,000; dwelling, $800; barns and other buildings, $400; stock (including work stock,) $1,400 and cash on hand for running expenses, $350.

The investment in real estate is somewhat greater acre for acre on farms that are developed for truck raising. The average acre value of truck farms is $184, of stock farms $145, and of staple crop farms $130.

The value of work stock per head increases when the size of farm increases, indicating that a better quality of work animals is utilized on the larger farms. Approximately the same investment in machinery and tools is found on all types of farm, of the same size, but the investment is greater on the larger farms than on the small ones, and this machinery is more efficiently utilized on the larger farms.

LAND CLEARING.

The greater number of investors in farms at present buy uncleared land. The removal of the vegetation (see fig. 2) is the first step toward the development of the farm. This clearing is usually done by Mexicans under contract, which is cheaper than by day labor. The cost of clearing varies widely, depending upon the character and quantity of vegetation, the range on 52 farms being from $5 to $25 per acre with an average of $11.65.

After the land is cleared it generally requires some labor for leveling. The tendency up to the present has been to give little attention to this matter. In order that land may be properly irrigated it must be level or have an even slope. The leveling is generally done in connection with the first breaking of the land, the average cost of the combined operations on 51 farms being $4.75, ranging from $2 to $18 per acre. Even a greater expense for leveling at this stage of development is justified, since it represents a saving in labor and an increase in production during the following crop seasons.

DITCH CONSTRUCTION.

The companies usually conduct the irrigation water to the farms through their main canals and laterals (see fig. 2). The farmer must construct the laterals (see fig. 4) for his own farm. A small farm level is an excellent investment for the purpose of laying out these

ditches as well as for leveling. The cost of construction of these ditches varies according to the lay of the land, ranging on 38 farms visited from $0.25 to $32 per acre, with an average of $2.25.

DITCH MAINTENANCE.

The irrigation water frequently carries mud in suspension, some of which is deposited in the canals. Weeds and grasses make luxuriant growth in the ditches, owing to abundance of moisture. These obstructions in the laterals are effective in hindering the passage of water so that the ditches must be cleaned annually. This is accomplished with a shovel or spade. Frequently a plow is run through the ditches to loosen the soil and weeds.

Where the ditches on the farm are small they are frequently plowed down entirely with the fields and are then reconstructed with the use of plows and pushes, most of the work being done by horsepower. (See fig. 3.)

The annual cost of maintenance of the lateral ditches on the farm varies widely, depending upon the number and character of the ditches. On some farms the cost is as low as $0.10 to $0.25 per acre, while on others it is as much as $2 per acre. The average cost as estimated by 32 farmers is approximately $0.65 per acre.

AVAILABLE TIME FOR FARM WORK.

Field work can be carried on during all months of the year, practically the only limiting factor being an excess of rainfall. The number of work days per month varies from about 19 in June and September to about 25 in July and August. There are approximately 256 days available for field work per year.

There is not a wide variation in the number of hours per day that field work is done, about 10 hours being the average. It is customary for both teams and men to rest for about two hours during the middle of the day during the warmer summer months.

LABOR UTILIZATION ON FARMS OF DIFFERENT TYPES.

Much more man labor is used on truck farms than on farms of other types, owing to the greater intensity of cropping. Slightly more horse labor is used per acre on truck farms than on others. The number of acres per work animal (acres of crops divided by number of work stock) is decidedly less on truck farms than on others. The average number of acres per work animal on the farms of different types is as follows: Truck farms, 14; stock farms, 17; and staple-crop farms, 18.

The cost of man labor per day is practically the same on farms of different types but the cost of horse labor per day is greatest on truck

farms, owing to poor utilization. On the average truck farm the cost of horse labor per day is $1.18; on stock farms, $1; and on staple-crop farms, $0.96.

COST OF WORK STOCK.

The average annual cost of maintaining work stock is $106 per head, which includes value of feed consumed, depreciation, interest, etc. The value of feed consumed per animal is approximately $90 per head.

There are nearly three times as many mules as horses utilized on the farms of the region. The average value of 75 horses encountered is $102 per head; of 196 mules, the average value is $143 per head. On farms averaging 31 acres of crop land the average value of horses is $96, and of mules $123. On large farms of 82 acres of crop land horses average in value $110 per head and mules $155. The value of feed consumed per head on the same farms increases from $72 to $96 as the size of farm increases.

DOUBLE CROPPING.

One of the most important factors affecting profits is the ability of farm operators to produce more than one crop on the same land during the same year. All farmers produce corn or other staple crops, but many do not produce second crops on this land during the same year. On 12 of the 59 farms studied no second crops were produced, and returns of but 2.4 per cent on the investment were made, while on 24 farms an average of more than one-half of the land produced a second crop during the same year. These 24 farms made average net incomes more than four times as great as those doing no double cropping.

The staple crops are essential to the stability of the farm business, but the truck crops when successful are much more profitable. The second or truck crops should be diversified in character, as any one crop of this class may be a failure, owing to market conditions or other causes, while others are entirely successful.

Double cropping is of prime importance to profitable farming in the lower Rio Grande irrigated district.

INCOMES ON IRRIGATED FARMS.

The average farm income (difference between expenses and receipts) of the 59 farms studied is $1,471. To find the net profit there must be deducted from this the value of supervision by the operator. The farms average in net returns 6.3 per cent on the investment.

The percentage return on investment is approximately the same for groups of farms of different sizes; however, the farm income increases when the size increases.

The amount of double cropping determines largely the type of farm as between truck and staple crop farms. The average returns of 26 truck farms which get 40 per cent or more of their receipts from the sale of truck is 8.7 per cent on the investment. The average net returns of 17 staple crop farms is 3.9 per cent on the investment. The average farm income of 16 stock farms is $1,281; these farms make net returns of 5 per cent on the investment.

DEPENDABILITY OF ENTERPRISES.

In a region of such mild climate there is naturally a wide range of enterprises that may be operated on each farm. That considerable diversification of enterprises leads to greater profits is apparent from the foregoing pages. There is much more risk involved in some of the truck enterprises than in some of the staple crops or in stock production, but on the other hand the profits from some of the risky enterprises are often great. Therefore some of these crops seem justified, not as a source of certain returns, but as a possible source of comparatively large profits. The following information gives some insight into the possibilities of some of the enterprises that have been advocated for the region.

TRUCK CROPS.

Information was secured from 50 farmers concerning the success and failure of 7 of the leading truck crops raised.

Of 165 separate crops of cabbage produced on 50 farms, 69 made returns larger than the cost of production, while 96 crops brought little or no returns. The average yield of cabbage is 8 tons per acre. (See fig. 4.)

FIG. 4.—Cabbage is one of the leading truck crops produced. This is nearly a perfect stand, half grown.

Of 68 crops of lettuce produced on 25 farms, 45.5 per cent of the crops were successful. The average yield harvested during the season of 1914–15 was 221 hampers per acre. (See fig. 5.)

Onions were produced on 18 farms, and more than half (61.5 per cent) of the crops were successful. The average yield of onions is approximately 260 bushels per acre. This crop is best adapted to the lighter textured soils of the western part of the region.

Irish potatoes were raised on 24 farms, records being secured on 69 crops. Forty-three of these crops were profitable. Potatoes yield on the average less than 100 bushels per acre.

FIG. 5.—Lettuce is an important truck crop. This field has been cut over once. Two more cuttings will be made.

Snap beans and tomatoes were produced on 22 farms, 65 crops of beans and 58 crops of tomatoes being recorded. Fifty-one per cent of the bean crops brought profits, and 43 per cent of the tomato crops succeeded.

Only 10 farms produced cantaloupes, 20 crops being raised. Only 4 of these crops were profitable.

While the profits from the successful truck crops average greater than the losses from the failures, it appears that in general any one truck crop is successful only about half the time. Potatoes and onions appear to be somewhat more likely to succeed than others, while cantaloupes are seldom successful.

Other truck crops, such as spinach, table beets, kohlrabi, garlic, peppers, eggplant, okra, and turnips, are produced quite extensively and are successful to about the same extent as those crops above mentioned. It not infrequently happens that some one crop comes on the market at a time when the product is scarce, and under such conditions very large profits may be made. For some crops it is

possible to determine in advance the approximate conditions of the market at harvest time, and thus the time and amount of planting may be controlled, but this is not general.

SPECIAL CROPS.

Strawberries are produced in limited quantities. The successful crops have generally been marketed locally. A large increase in acreage is not encouraged.

Sugar beets have been advocated, but the beets grown thus far have not been sweet enough to justify the enterprise as a source of sugar production.

Grapes have been tried without success, failure being due to plant diseases and to lack of knowledge of methods. Some attention has been given to the cultivation of figs as a commercial proposition, but thus far this enterprise has not met with success.

Considerable attention has been given to the production of citrus fruits, and the production of oranges and grapefruit has been the basis of much advertising for the region. A very good quality of fruit is produced when the various difficulties of production are overcome, but no growers were found who had made a financial success of these enterprises. Among the difficulties encountered are loss of stock from freezing, disease, insect injuries, and lack of knowledge of methods of handling an enterprise of such delicate and varied requirements.

Sugar cane is produced principally on the large farms or plantations. On account of the fact that this crop requires equipment of large size and a great amount of power, it is not adapted to the average farm of the region.

Recently castor beans have been attempted on a commercial basis, but these have not been grown a sufficient length of time to determine their success.

STAPLE CROPS.

Corn is the leading staple crop raised in the region; the average yield is 42 bushels per acre. The average cost of producing corn for the market under conditions prevalent at the time of this study was 78 cents per bushel, while the market value was 67 cents. When corn is produced as a side line on truck farms the cost is less than 30 cents per bushel. It is more profitable to feed corn to stock than to dispose of it on the market. The crop is not raised profitably as the main source of income of the farm, but when produced to balance up the farm organization it is very profitable.

Alfalfa is produced successfully on well-drained land where little or no alkali is found. The average yield under present conditions is slightly over 4 tons per acre, or about 1 ton per cutting, produced at a cost of $8.60 per ton. The market value is approximately $13.50 per ton. As in other regions, good drainage is an absolute essential to the successful production of alfalfa here.

FIG. 6.—Sorghum for hay is of considerable importance. This field yielded nearly five tons of cured hay per acre.

Sorghum (see fig. 6) is the principal hay crop. Practically every farm produces a small acreage for home consumption. The average yield is nearly 5 tons of cured hay per acre; the cost of production is $8 per ton.

Stock beets are meeting a considerable demand for winter and spring stock feed (see fig. 7). These are particularly adapted to hog consumption. This feed averages 28 tons per acre at a cost of slightly less than $2 per ton.

Oats (Texas red-rust proof) (see fig. 8) are raised for pasture only; the crop seldom matures grain in this climate. These are planted in the early fall and are pastured from six to eight weeks later. With proper irrigation oats are pastured during three or four intervals through the winter, sometimes lasting into the summer. Not infrequently they are cut and fed as a soiling crop.

Among other feed crops that appear successful are Sudan grass and Rhodes grass, both of which may be utilized for either hay or pasture.

Cowpeas have received little attention up to the present, but a number of truck farmers find them very profitable as a green-manure crop to be plowed under. In a few cases the crop has been utilized as hay, very satisfactory yields being made.

Cotton has been produced in the region for many years both under irrigation and by dry-farming methods. Since the advent of the boll weevil the crop has not been generally successful, although occasional crops show very satisfactory yields. A yield of more than a bale per acre is common when the boll weevil does not attack the crop.

Attempts have been made at production of many other truck, staple, and special crops with indifferent success. A sufficient num-

ber have been mentioned above to show to some extent the possibilities and trend of production of the region.

STOCK PRODUCTION.

Hogs.—On account of the unstable conditions affecting the production and marketing of special crops considerable attention has been given to the production of stock; the principal lines followed are hog raising and dairying. Very satisfactory yields of feed crops have been a factor in advancing these enterprises. Of the breeds of hogs the Duroc Jersey is the most common; Poland China and Berkshires, however, are receiving some attention, while Tamworths and Hampshires are found in limited numbers. While the profits from hog raising under normal conditions are not so large as the fancy returns from some of the truck crops, the stability of the enterprise is such as to attract many to this type of farming. (See fig. 8.)

Very little cholera has appeared up to the present time, but there are a number of minor factors that are of importance, among these being the absolute necessity for shade protection in summer, and for a supply of pure water for the hogs, and the danger of infection of the stock by lice, mange, screw worms and other pests. That shade and a satisfactory supply of pure water are absolute essentials to successful hog production in the region has been fully demonstrated. Very satisfactory shade can be provided at very low cost by means of posts and cross poles covered with reeds or corn stalks or old sorghum hay. (See fig. 9.)

Concrete wallows filled with pure water offer perhaps the most satisfactory method of supplying the stock with water. Earthen wallows are used extensively, but there is difficulty in keeping them

FIG. 7.—Stock beets. This crop is receiving considerable attention as a feed crop for hogs.

FIG. 8.—Hogs are profitably pastured on winter oats.

clean: further, the sticky mud often adheres to the bellies of the hogs, sometimes causing sores, particularly in the case of sows with suckling pigs. Watering troughs are used, but there is danger of the supply failing at a critical time; further, it appears advisable for the animals to get into the water.

During warm weather various pests, such as lice and mange, attack the hogs. A very simple remedy for prevention and cure is the use of crude oil as a disinfectant. This may be applied directly from a sprayer or by pouring on the backs of the animals, or it may be placed in a rubbing post. It is not uncommon to place the crude oil on the surface of the water in the wallows. When the pests become well established before being discovered, an emulsion of coal oil and soap solution is commonly used as a spray.

Small scratches and the eyes and noses of pigs often become infected during the summer and if these infections are not cleansed they frequently cause considerable losses. Screw worms develop and bury deeply into the flesh. The use of crude oil as above indicated goes far toward preventing infection, but when screw worms have developed they must be removed or killed by the use of chloroform or the like.

Very few buildings are necessary for successful hog production; a shade for summer, a slight protection from cold rains during "northers" in winter, and farrowing pens for sows and pigs, fully answer the requirements.

Dairying.—This enterprise is receiving considerable attention, whole milk and cream being sold. The number of farms that can profitably sell whole milk is limited by the population of the towns supplied, so that this method of disposing of the dairy products can not be extended far beyond the present. There are a few very

profitable whole-milk dairy farms in operation, generally close to the towns.

Several creameries are in operation in the region and the farms supplying the cream are generally fairly profitable. At the present time large quantities of dairy products are brought into the lower Rio Grande Valley from northern sources, so that there should be a place for further development of this type of farming. Farms selling cream do not appear quite so profitable as those selling whole milk.

STABILITY OF TYPES OF FARMING.

From the foregoing discussion it appears that certain enterprises, such as the production of truck crops, are decidedly risky in this area. When the farms are properly organized, however, the total risk is reduced, since the success or failure of any one enterprise is not dependent upon or associated with another enterprise so far as market conditions are concerned.

Stock farms and staple crop farms are more stable, but not generally so profitable as farms producing considerable truck properly diversified. It appears that where the farm is so operated as to have from 40 to 50 per cent of the crop acres (including double-cropped land) in truck crops, better returns are made than when less truck is raised. On these farms about 40 per cent of the crop area is double-cropped and from 60 to 75 per cent of the total farm receipts are from the sale of truck products. Practically the whole farm produces staple crops during the summer and about one-half of it is in truck during the winter.

Hog raising in connection with truck production appears profitable and justified. A very large amount of otherwise waste material is

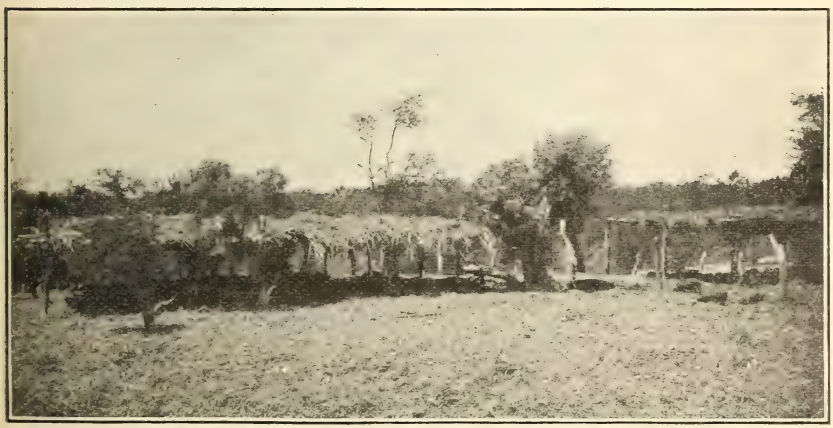

FIG. 9.—A cheap and satisfactory shade can be provided for the protection of hogs in summer by means of posts, cross poles, and hay or straw.

utilized on the successful truck-hog farm. Truck production does not appear to be generally successful where any considerable dairy business is conducted, although there are not sufficient data to make this conclusion definite.

FARM BUSINESS ILLUSTRATED.

For the purpose of showing the methods followed by farmers of some experience in the region, the actual operation of farms of three types is described, with some detail as to the character and extent of crops, receipts, expenses, and profits.

A TRUCK FARM.

The first farm is one on which truck production is the main enterprise. It is located in Hidalgo County and comprises 83 acres, of which 74 acres is crop land. On this 74 acres of crop land 100 acres of crops were harvested, 26 acres being double cropped, from March 1, 1914, to March 1, 1915. This farm represents an investment of $16,600 in real estate, or $200 per acre. Of the real estate valuation, $1,100 covers buildings. The stock on the farm was valued at $913 at the beginning of the year and consisted of 6 work animals, worth $450; 1 cow and 1 heifer, worth $145; hogs, worth $280; and poultry valued at $38.

For the operation of the farm there were machinery and tools to the value of $150, consisting of wagon, buggy, plows, cultivators, harrows, hoes, spades, etc. This equipment was estimated by the operator to have an average working life of about eight years. The amount of cash required to be kept on hand for current expenses was $800. Various crops were produced, the yields and sales from which are shown as follows:

Truck farm: Yields and sales of crops.

Crop.	Acres.	Unit of yield.	Yield.	Sales.
Corn	50	Bushel	2,500	$630
Sorghum	3½	Ton	20	(a)
Cowpeas	8			(b)
Grass pasture	2			
Snap beans	8	Bushel	600	900
Cabbage	9	Ton	36	410
Onions	8	Bushel	2,500	1,192
Green peas	4	do	30	30
Lettuce	1	Hamper	350	128
Potatoes	1¼	Bushel	125	215
Miscellaneous, nursery, etc	5			280
Total crop	99¾			3,785
Hog sales				352
Miscellaneous				71
Total receipts				4,208

a Feed. b Plowed under.

The principal items of expense were as follows: Labor, $1,445; seed, $163; crates, hampers, etc., $433; irrigation water, $451; taxes, $55. The depreciation of the buildings and machinery for the year was estimated by the operator to be $90. The total expenses of all kinds for the year's business to the operator, except the value of his own labor, amounts to $2,671.

As has been shown, the total receipts from all sources amounted to $4,208. When the expenses are deducted from the receipts the farm income is $1,537. The operator valued his own labor at $600 per year, which is deducted from the farm income. This shows a net income of $937, which is 5 per cent on the total investment of $18,513.

The degree of double cropping could be increased with profit on this farm. Only 35 per cent of the crop land produced a second crop during the year, and 8 acres of this land was in cowpeas. Crops that might increase profits by increased acreage are lettuce and potatoes.

An increase in the hog business doubtless would be profitable, providing slightly better management of the enterprise were provided. The farm supports seven brood sows producing two litters each per year. With this increase in hogs would follow the production of some other crops as hog feed, such as stock beets and oats for pasture. Greater profits would be made if the $630 worth of corn sold had been fed to hogs for the market.

The increase in acreage above suggested would not require the addition of further equipment. The acreage of crops per work animal was less than 17 at the time of this study.

A HOG FARM.

The following data show the business of a fairly successful hog farm located near the Rio Grande in Cameron County.

The farm consists of 71 acres, of which 59 acres is crop land, 7 acres permanent Bermuda grass pasture and 5 acres waste land. The real estate investment amounts to $14,200, of which the dwelling represents $800, barn, $200, and other buildings, $50. At the beginning of the year's business (1914–15) there was stock on the farm valued at $1,160, distributed as follows: Two cows and 2 calves, $80; 6 head of work stock, $527; 15 brood sows and boar, $250; poultry, $38; and 53 stands of bees, $265. Machinery and tools were valued at $734. Feed on hand at the beginning of the year was valued at $260, and the cash on hand for running expenses, $600. The total investment was therefore $16,954.

Few crops were raised, the principal crop being corn. Acreage and yield of crops were as follows:

Hog farm: Acreage and yield of crops.

Crop.	Acres.	Unit of yield.	Total yield.
Corn	47	Bushels	[a] 850
Oats pasture	3		
Milo maize	3	Tons	12
Alfalfa	1		
Sorghum	2	Tons (green)	50
Stock beets	2	Tons	90
Miscellaneous	1		

[a] 30 acres of corn was drowned out by river overflow, so that this yield was actually made on 17 acres.

No sales of crop products were made, all crops raised being fed on the place. This farmer followed the practice of slaughtering all hogs raised and selling the product as dressed meat. He was able to make a fair profit on the labor of slaughtering.

The amount of actual hog sales for the year was $1,256. The value of the stock increase on the farm for the year, exclusive of sales, amounted to $1,544. Total receipts from all sources were $2,830.

The principal items of expense were as follows: Labor, $417; machinery repairs, $137; feed bought (principally corn), $339; and irrigation water, $196. Depreciation of buildings and equipment was estimated to be $212. The total expense of farm operation, exclusive of the value of the operator's own labor, was $1,538.

The farm income is $1,292; when the value of the operator's labor ($450) is deducted, the net farm income is $842, or 5 per cent on the investment of nearly $17,000.

The horse-labor efficiency on this farm is low, only 10 acres being operated per animal. An automobile is used extensively for light hauling. No double cropping is practiced. All the receipts are from one source, namely, hogs. More machinery and tools are kept on this farm than are efficiently utilized, which accounts for a high repair bill in the expenses.

This farm could be made highly successful by diversification. The present acreage of corn is apparently about right to supply the farm needs when no accident such as overflow of the river interferes. Four or five different truck crops should be added to the organization. Doubtless more green forage for the hogs would be profitable. These increases in acreage of crops would increase the efficiency of equipment. From 15 to 20 acres of other crops can be raised under this organization and the principal added cost be only that for hired labor and irrigation water. The hog business should remain at about its present magnitude.

STAPLE CROP FARM.

Near the center of the irrigated district is a staple crop farm which produces some truck and a few hogs as side lines. This farm is perhaps better managed than the average, but an analysis of the business shows where certain improvements in organization can be made.

The farm comprises 100 acres, of which 95 acres is crop land, on which were produced during the year 113 acres of crops. The real estate investment amounts to $20,000, of which the house represents $500; barn, $100; and other buildings, $100. At the beginning of the year of this study the farm was stocked as follows: Six head of work stock, worth $680; 1 cow, $75; 6 brood sows and 36 other hogs, $390; and poultry, $38. The machinery and tools considered necessary for the cultivation of this irrigated farm were valued at $258. The cash on hand required to run the business amounted to $500. Feed on hand at the beginning of the year was worth $30. The total investment of the farm was therefore $21,971.

A considerable variety of crops was produced, the acreage, yield, and sales of each being as follows:

Staple crop farm: Acreage, yields, and sales of crops.

Crop.	Acres.	Unit of yield.	Total yield harvested.	Sales.
Corn	80.0	Bushel	4,550	$1,407
Sudan grass	4.5	Ton	24	
Cowpeas	1.5		(a)	
Rhodes grass	1.0		(b)	
Stock beets	1.0	Ton	30	
Sorghum	.5	do	2	
Alfalfa	5.0	do	5	
Cabbage	10.0	do	48	725
Lettuce	7.0	Hamper	850	425
Miscellaneous	2.5			
Stock sales				614
Receipts for outside work				255
Total	113.0			3,426

a Plowed under. b New.

The principal items of expense for the year's business were: Hired labor, $800; feed bought, $100; seed, $70; crates, hampers, etc., $106; and irrigation water, $320. The total expenses for the year, including depreciation, were $1,573.

When expenses are deducted from receipts the farm income is seen to be $1,853. The operator valued his own labor at $720. When this is deducted from the farm income there is left a net farm income of $1,133. This represents a return of 5 per cent on the farm investment of approximately $22,000.

This farm produced second crops on 19 per cent of its crop land. Each work animal covered the equivalent of 19 acres of crops. Slightly more than 41 per cent of the receipts were from the sale of

corn. The returns from the truck crop, cabbage, were low, the small yield indicated being all that was harvested. There was little market demand for cabbage so the remainder of the crop, about 8 tons per acre, was not cut. The same is true of lettuce, the average price received for the amount harvested being 50 cents per hamper, which is approximately the cost of production.

The acreage of second crops could be increased on this farm without increasing the amount of working capital. These second crops would be principally truck, other than cabbage and lettuce. Practically the only added expenses would be for hired labor and cost of irrigation water. The overhead expenses for the farm would remain practically the same. Increasing acreage of crops without added work stock would increase the efficiency of the animals and reduce the proportionate cost of horse labor to the various crops.

Since in general not all of the truck crops fail at the same time, crops other than cabbage and lettuce doubtless would have brought good returns, so that the truck business of the farm would have been profitable instead of only returning cost of production, as in this case.

Other crops for hog feed should be included in the organization and the magnitude of the hog business increased. The corn sold would doubtless have been more profitable if fed to hogs.

GENERAL CONDITIONS.

Conditions of irrigation and the varied character of the soils are factors which are new to nearly all who come to the region from other parts of the United States. Drainage, either natural or artificial, is necessary under all irrigation projects.

SOILS.

The soils of the irrigated district are varied in character, both with respect to differences in types and to differences in groups of types or series. Soils of the upland which are residual in character are of loam or sandy loam, and are located approximately to the north of the railroad in Hidalgo County. The soils of southern Hidalgo and Cameron Counties are derived from the delta formation (river deposits), and vary in texture from heavy black clay to medium-textured silt loams. These soils are affected somewhat by the temporary overflows of the present time. A silty soil known locally as "chocolate loam" is found along many of the resacas: this type is one of the best of the region on account of its ease of cultivation and better drainage conditions. The upland soils, on account of their lighter texture, have some underdrainage, which improves this condition materially in the western part of the region.

Practically all of the well-drained soils contain considerable percentages of lime, so important in the production of alfalfa. All soils of the region are exceptionally fertile and very productive when proper drainage and irrigation conditions are provided.

ALKALI.

Some of the low-lying soils contain alkali and, as is the case with all irrigated regions in dry climates, the use of irrigation water intensifies this condition. This is more particularly true near the larger canals, where seepage water permeates the bordering land. The use of drainage ditches and particularly opened "borrow pits" helps materially to improve this condition.[1] Tile drainage is sometimes resorted to where proper outlets are available. Thorough drainage will overcome these seeped and alkaline soil conditions.

CLIMATE.

The climate of the region is mild and healthful. The winters are sufficiently warm for the production of the principal truck crops. While the summers are comparatively long, they are not excessively hot, temperature seldom being higher than 98° F. There are short periods of disagreeable weather conditions in winter known as "northers," which are the southern phase of blizzards of the northwest and are accompanied generally by considerable wind and rain. The temperature often falls to the freezing point during these periods.

The average date of the first killing frost in the fall is December 21 and of the last in the spring February 6. The earliest frost date on record is November 15, and the latest in spring is March 5. It is not uncommon for a winter to pass without a single frost.

The average annual rainfall is approximately 27 inches, with the greatest monthly rainfall occurring during June and September. On account of the fact that many of the rains are torrential in character, the total precipitation is not so beneficial as is the case with slower and well-distributed rainfall. Not infrequently the annual rainfall reaches a maximum of 40 inches, while it may be as low as 12 inches per year.

There are occasional seasons when the rainfall is so well distributed and in such quantity as to make irrigation unnecessary. Indeed, in the vicinity of Lyford and Raymondville all crops are produced under dry-farming conditions, though the strictest methods of moisture conservation are necessary for successful farming.

The region is generally healthful, the subtropical diseases being very rare or nonexistent. Mosquitoes, fleas, and other insects are not serious pests to the inhabitants. On account of the mild climate there are a number of insect pests and plant diseases that attack crops to some extent.

[1] A "borrow pit" is an excavation or ditch bordering a canal from which earth has been taken to form the banks of a canal. The pits are often irregular in size and depth, but when opened from one to another successively, drainage of seepage water from the canal may be effected.

FIG. 10.—The Rio Grande. This is the source of water for irrigation purposes.

IRRIGATION.

As above stated, crops are sometimes produced without irrigation, but during most seasons irrigation is essential to the best production.

All water for irrigation purposes is taken from the Rio Grande (see fig. 10), which borders the district on the south. Private capital has developed 20 or more separate systems for supplying water to farmers. Companies are incorporated under Texas laws, and when land is bought by the farmer contracts must be made with the companies to supply the necessary irrigation water.

The cost of water to the farmers varies considerably under different companies. Under some systems water is contracted for by the year at a stipulated price per acre. In such cases the farmer may produce as many crops and make as many irrigations as he desires. In other cases a flat rate of $3 or $4 per acre per annum is charged by the company, and then each acre irrigation costs $1 above this flat rate. This method is becoming common. In still other cases water is furnished at a stipulated price per crop.

The land companies and irrigation companies are generally separate organizations, although the same men are not infrequently directors in each.

On account of the many difficulties encountered in the development of irrigation systems, as well as in securing land buyers rapidly enough to place most of the land under irrigation quickly, some of the companies have had considerable financial difficulties. Under these conditions it is common for the farmers under the system to organize irrigation districts under the laws of Texas, issue and sell bonds, and purchase the irrigation systems. The land is the security

for these bonds. Under this method the landowners become the owners of the irrigation systems and operate them through their own representatives.

There are many instances where for various reasons water has not been furnished. This has caused considerable loss to the farmers and accounts to some extent for the withdrawal of many farmers from the region. Many of those who have moved away have lost considerable portions of their original investments.

While the prices paid by the districts for the irrigation systems are frequently high, the operation of the plants by the farmers themselves will doubtless insure water to the farmers with much greater certainty than has been customary in the past.

LAND TITLES AND PRICES.

Title to the land of the region was in general originally derived from the Spanish and Mexican Governments. Grants of many thousands of acres with a frontage on the Rio Grande were ceded to individuals before Texas became a part of the United States, and title to much of this land has never existed in the name of the State of Texas or of the United States. In opening for settlement, options were secured on the land and sometimes titles from the descendants of the original grantees. Land companies were organized for the purpose of reselling the land to actual farmers. A complete chain of title to this land is usually furnished by the companies for the purpose of examination by intending purchasers. It is possible to have these titles guaranteed by companies authorized to act under the laws of Texas. As soon as the irrigation companies had installed the pumping plants and provided sufficient canals so that even small quantities of water could be supplied, the land was placed on the market. By means of advertising in many other parts of the United States farmers and others are induced to come to the region to buy land.

Prices vary considerably under different companies, ranging from about $100 to $300 per acre for raw land. These prices pay for the water contracts as above described. Individuals outside of the companies hold land at from $40 to $75 per acre, but these lands do not always carry contracts for delivery of water by the irrigation companies.

Land may be rented either on the share basis or for cash at very reasonable rates, considering the price of land. Many farms have been operated by cash tenants for the consideration of from $3 to $10 per acre. The average cash rent for land, as estimated by 59 farmers of the area, is approximately $7 per acre.

LABOR.

The laborers of the section are almost altogether Mexican. Scarcely any negroes are encountered (1915). This labor is employed by the day, by the week, or by contract. Ordinarily laborers are secured at from $0.75 to $1 per day without rations, and the rate is practically the same by the week. In some instances laborers and their families are provided with houses (jacals) on the farms, and the labor is utilized as needed. This practice tends to secure stability and also increases the efficiency of the labor.

Practice has established that the employment of Mexican labor by contract is the cheapest and generally the most efficient. For such work as clearing land, transplanting and harvesting truck crops, etc., contract labor is commonly utilized. This method is particularly satisfactory since men, women, and children of the Mexican families perform labor of this character.

Mexican labor is comparatively inefficient, owing partly to lack of intelligence and lack of knowledge of good methods. While the average cost of hired labor is about $0.80 per day the cost of supervision as shown by records from 59 farms is $0.75 per day, so that the actual cost to the farmer is approximately $1.50 per day. A large percentage of the Mexican laborers can not speak English.

TRANSPORTATION.

The lower Rio Grande Valley is provided with only one railroad to outside markets. The St. Louis, Brownsville & Mexico lines (part of the St. Louis & San Francisco system) connect Brownsville with Houston, a distance of 372 miles (see fig. 1). By means of the San Antonio & Aransas Pass lines connection is made at Sinton, Tex., for San Antonio.

The St. Louis, Brownsville & Mexico Railway operates a branch line from Harlingen west to Mercedes, Mission, San Fordyce, and other points. Since the shipment of perishable produce has reached a considerable magnitude some difficulty has been encountered in the past in securing cars for freight transportation.

A local line, the San Benito & Rio Grande, known as the "Spiderweb" (see fig. 1) operates northeast and southwest from San Benito. A branch line of the St. Louis, Brownsville & Mexico Railway connects San Juan with Edinburg, the county seat of Hidalgo County. Another line extends north from Mission to Monte Christo.

The Rio Grande Railway, one of the oldest railroads in Texas, connects Brownsville with Point Isobel and Brazos Santiago Pass. Before the construction of the St. Louis, Brownsville & Mexico Railway to Brownsville, this line furnished the principal means of transportation. Formerly small freight and passenger boats from Gulf seaports entered Laguna Madre through Brazo Santiago Pass to

Point Isobel. Very little if any commerce is now carried on between Point Isobel and other Gulf ports.

MARKETS.

Brownsville, with a population of over 10,000, is the largest city of the region, and is located on the Rio Grande. San Benito, Harlingen, La Feria, Mercedes, Donna, Edinburg, Pharr, McAllen, and Mission each have a population of less than 5,000 people. The local consumption of farm produce, therefore, is quite limited. Houston and San Antonio are the nearest of the larger markets. A large volume of the perishable produce is sent to middle western cities, such as Kansas City, St. Louis, Omaha, Chicago, and St. Paul. Occasionally shipments are made as far east as New York City. The most important market for live hogs is Fort Worth, although Houston receives considerable numbers.

CONCLUSIONS.

The information and conclusions contained in this bulletin apply to conditions as they existed prior to the European war, and should in no way be interpreted as pertaining to abnormalities brought about by this cause. The data here presented were gathered during 1914 and 1915.

For farmers who desire a mild, healthful climate, the lower Rio Grande Valley is very desirable. A considerable amount of capital is required to develop an irrigated farm and a reasonable knowledge of general farming is of primary importance. For successful business, on account of climatic conditions and possibilities of irrigation, intense cultivation and good managerial ability are essential. Supervision of the Mexican labor must be close for its most efficient use.

Good land can be secured at prices ranging from $50 to $250 per acre, or it may be rented for from $3 to $10 per acre. Drainage and alkali conditions should be investigated carefully before purchasing land.

It appears that farms of less than 40 acres are not so successful as those of larger size. In general, staple crop and stock farms are larger in acreage than truck farms, although the last-named type, being more intense, does a larger business, acre for acre, than do farms of the other types.

The double cropping is of prime importance. This increases the magnitude of the business with but little effect in capitalization, and materially increases the profits. When 50 per cent of the crop land is utilized for a second crop the net returns are greater than when a smaller acreage is double cropped.

The most successful farms are those which produce a considerable diversity of truck crops during the winter months, practically the whole farm being in staple crops during the summer. The growing of truck and feed crops, with hogs as a side line, makes one of the most satisfactory types of organization from the standpoint of stability and profits. It appears that it is more profitable to feed corn to stock than to sell it on the market, although when produced as a side line it is generally profitable.

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